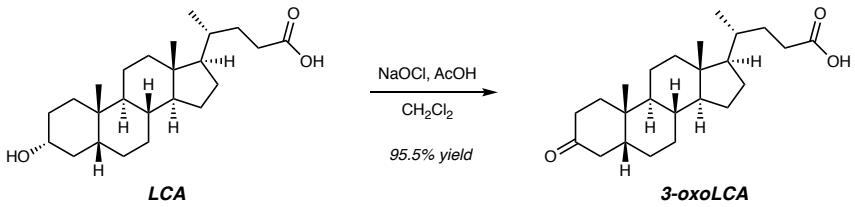
**Supplementary Information**

## 1. Key Reagents Table

| REAGENT | SOURCE | IDENTIFIER |
|---|---|---|
| Antibodies | | |
| FACS antibody | | |
| IFNγ | eBioscience | clone: XMG1.2 |
| IL-4 | BioLegend | clone: 11B11 |
| IL-17a | eBioscience | clone: eBio17B7 |
| FoxP3 | eBioscience | clone: FJK-16s |
| CD4 | eBioscience | clone: RM4-5 |
| CD3e | eBioscience | clone: 145-2C11 |
| CD45 | BioLegend | clone: 30-F11 |
| CD25 | eBioscience | clone: PC61.5 |
| CD69 | eBioscience | clone: H1.2F3 |
| CD44 | BioLegend | clone: IM7 |
| CD62L | eBioscience | clone: MEL-14 |
| CD45RB | BioLegend | clone: C363-16A |
| Nur77 | eBioscience | clone: 12.14 |
| ChIP antibody | | |
| Rabbit IgG | abcam | ab46540 |
| H3K27Ac | abcam | ab4729 |
| H3K4me1 | abcam | ab8895 |
| p300 | abcam | ab14984 |
| Cytokines | | |
| IL-2 | PEPROTECH | 200-02 |
| IL-4 | R&D systems | 404-ML-010 |
| IL-6 | eBioscience | 14-8061-62 |
| IL-12 | PEPROTECH | 210-12 |
| TGF-β | PEPROTECH | 100-21 |
| hamster IgG | MP Biomedicals | 856984 |
| anti-CD3 | eBioscience | clone: 145-2C11 |
| anti-CD28 | eBioscience | clone: 37.51 |
| anti-IL-4 | eBioscience | clone: 11B11 |
| anti-IFNγ | eBioscience | clone: XMG1.2 |
| anti-TGF-β | eBioscience | clone: 1D11.16.8 |
| IgG1 isotype | eBioscience | clone: P3.6.2.8.1 |
| Chemicals | | |
| DMSO | Sigma | D8418 |

| | | |
|---|---|---|
| Retinoic acid | Sigma | R2625 |
| iBET | Millipore | 401010 |
| Aqua | ThermoFisher | L34957 |
| AnnexinV | eBioscience | BMS306FI/100 |
| CFSE | BioLegend | 423801 |
| mitoQ | Focus Biomolecules | 10-1363 |
| mitoSOX | ThermoFisher | M36008 |
| mitoPQ | Abcam | ab146819 |
| DCFDA | Sigma | D6883 |
| MitoTracker Green | ThermoFisher | M7514 |
| JC-1 | ThermoFisher | T3168 |
| PMA | Sigma | P1585 |
| Ionomycin | Sigma | I3909 |
| GolgiPlug | BD | 555029 |
| Seahorse drugs | | |
| XF mito stress kit | Agilent | 103015-100 |
| XF glycolysis kit | Agilent | 103020-100 |
| Bile Acids | | |
| screen library | Michael Fischbach lab | |
| 3-oxoLCA | Steraloids | C1750-000 |
| isoalloLCA | Steraloids | C0700-000 |
| isoLCA | Steraloids | C1165-000 |
| β-MCA | Steraloids | C1895-000 |
| glyco-3-oxoLCA | Michael Krout lab | |
| glyco-isoalloLCA | Michael Krout lab | |
| Bulk chemical synthesis | Michael Krout lab | |

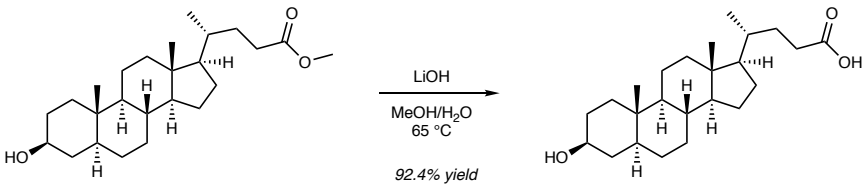
## 2. Chemical Synthesis of 3-oxoLCA, isoalloLCA, glyco-3-oxoLCA, and glyco-isoalloLCA




**3-oxoLCA.** 3-oxoLCA was prepared on a large scale by the oxidation of LCA according to the following procedure. Glacial AcOH (160 mL) and $CH_2Cl_2$ (160 mL; total concentration 0.2 M) were added to a 1 L round-bottom flask charged with a stir bar and LCA (24.08 g, 63.95 mmol, 1.0 equivalent). The suspension was stirred until complete dissolution and then immersed in a room temperature water bath. An addition funnel was affixed to the flask and charged with NaOCl (77.6 mL, 95.95 mmol, 1.5 equivalents; 8.25 wt% Clorox® solution). The bleach solution was added dropwise over a period of ~30 minutes with vigorous stirring. A slight yellowing of the reaction occurred; too rapid of an addition leads to a bright yellow solution and should be avoided. Upon consumption by thin-layer chromatography (TLC) analysis (~16 h; 19:1 $CH_2Cl_2$/ethyl acetate + 2% AcOH; *p*-Anisaldehyde stain), the excess oxidant was quenched by the addition of *i*-PrOH (24.5 mL, 320 mmol, 5 equivalents). After an additional hour, the reaction was concentrated in vacuo to a slurry. The white slurry was partially dissolved in $CH_2Cl_2$ (400 mL), transferred to a separatory funnel containing a 5% aqueous solution of $NaHSO_3$ (150 mL) and acidified to pH < 3 with 1 M HCl. The layers were vigorously mixed, separated, and the aqueous layer was extracted with $CH_2Cl_2$ (3 x 25 mL). The combined organic layers were washed with saturated aqueous NaCl (50 mL), dried over $Na_2SO_4$ for > 30 minutes, filtered and concentrated in vacuo. The resulting colorless to pale yellow oil forms a white solid

over time as the AcOH is removed. The crude $^1$H NMR ($CDCl_3$) shows only the desired product with AcOH; however, storage over about a day leads to a noticeable yellowing of the material that increases over time (presumably due to residual oxidant). The crude solid is purified by trituration with $Et_2O$/hexanes. To break up any large chunks, $Et_2O$ (100 mL) and a stir bar are added to the crude solid and stirred. Hexane (100 mL) is then added while stirring, and then the contents were placed in an ice bath and mixing ceased. Vacuum filtration with washing and vacuum drying afforded 3-oxoLCA as a white, crystalline solid (19.488 g, 52.028 mmol, 81.4% yield). The filtrate was concentrated and triturated in a similar manner (30 mL total of 1:1 $Et_2O$/hexanes) to generate an additional portion of white crystalline solid (3.3836 g, 9.033 mmol, 14.1% yield). The combined mass of 3-oxoLCA was 22.872 g (61.061 mmol, 95.5% yield).

***Characterization data[1,2]:*** $R_f$ = 0.31 (19:1 $CH_2Cl_2$/ethyl acetate + 2% AcOH; *p*-Anisaldehyde); mp 138–141 °C; $^1$H NMR (600 MHz, $CDCl_3$): δ 2.69 (app t, *J* = 14.3 Hz, 1H), 2.40 (ddd, *J* = 15.6, 10.3, 5.2 Hz, 1H), 2.33 (td, *J* = 14.7, 5.3 Hz, 1H), 2.26 (ddd, *J* = 15.8, 9.6, 6.4 Hz, 1H), 2.17 (app d, *J* = 14.2 Hz, 1H), 2.03 (dt, *J* = 8.8, 4.5 Hz, 3H), 1.88 (ddt, *J* = 13.6, 9.2, 4.6 Hz, 2H), 1.83–1.80 (m, 2H), 1.62–1.59 (m, 1H), 1.52–1.06 (m, 15H), 1.02 (s, 3H), 0.94 (d, *J* = 6.5 Hz, 3H), 0.69 (s, 3H); $^{13}$C{$^1$H}NMR (151 MHz, $CDCl_3$): δ 213.7, 179.8, 56.6, 56.1, 44.5, 42.9, 42.5, 40.9, 40.2, 37.4, 37.2, 35.7, 35.5, 35.0, 31.1, 30.9, 28.3, 26.8, 25.9, 24.3, 22.8, 21.4, 18.4, 12.2; IR (ATR): 2925, 2878, 2858, 1698, 1376, 1307, 1264, 945, 735 cm$^{-1}$; HRMS (DART–) *m/z*: [M – H]$^-$ calculated for $C_{24}H_{37}O_3$ 373.2743, found 373.2752; $[\alpha]_D^{21.5}$ +31.5 (*c* 1.205, $CH_2Cl_2$). NMR spectra and *in vitro* assay for comparison of 3-oxoLCA from in-house synthesis and a commercial source (Steraloids) are shown in Supplementary Fig. 1 and 2.

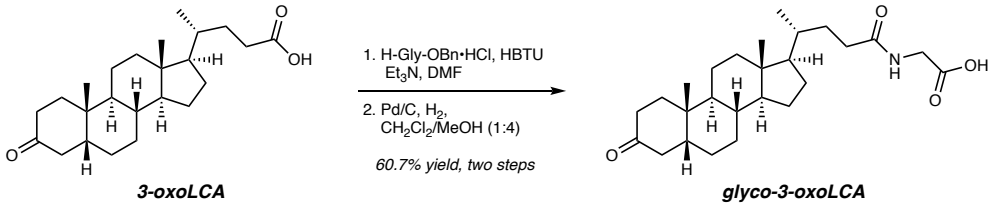



***methyl isoalloLCA*** ***isoalloLCA***

**IsoalloLCA.** IsoalloLCA was prepared on a large scale by the saponification of methyl isoalloLCA according to the following procedure. Methanol (271 mL) was added to a 1 L round-bottom flask charged with a stir bar and methyl isoalloLCA (6.616 g, 18.894 mmol, 1.0 equivalent). A reflux condenser was affixed to the flask, and the contents were placed under argon and warmed to 65 °C to yield a clear solution. $H_2O$ (67 mL; 5:1 methanol:$H_2O$, 0.05 M) was added to this solution followed by LiOH (2.023 g, 84.47 mmol, 5.0 equivalents) at 65 °C. Upon completion by TLC analysis (2:1 hexanes/ethyl acetate; *p*-Anisaldehyde), the reaction was cooled to room temperature and concentrated in vacuo to a white slurry. $H_2O$ (200 mL) was added to this slurry, followed by acidification to pH < 3 with 1 M HCl. The congealed mass was sonicated at > 50 °C for at least 3 h to yield a free-flowing, fluffy white solid. The contents were cooled to room temperature, then in an ice bath and isolated via vacuum filtration. Washing and further drying of the filter cake (high vacuum) yielded isoalloLCA as a powdery white solid (5.8797 g, 15.613 mmol, 92.4% yield).

***Characterization data[3]:*** $R_f$ = 0.23 (1:1 hexanes/ethyl acetate; *p*-Anisaldehyde); mp 206–210 °C; $^1$H NMR (600 MHz, DMSO-$d_6$): δ 11.96 (br s, 1H), 4.40 (br s, 1H), 2.22 (ddd, $J$ = 15.3, 9.7, 5.4 Hz, 1H), 2.11–2.06 (m, 1H), 1.91 (app d, $J$ = 12.3 Hz, 1H), 1.81–1.74 (m, 1H), 1.68–0.80 (m, 24H), 0.86 (d, $J$ = 6.6 Hz, 3H), 0.74 (s, 3H), 0.61 (s, 3H), 0.61–0.57 (m, 1H); $^{13}$C{$^1$H} NMR (151 MHz, DMSO-$d_6$): δ 174.8, 69.3, 56.0, 55.5, 53.8, 44.4, 42.2, 38.2, 36.6, 35.07, 35.04, 34.8, 31.7, 31.3, 30.77, 30.68, 28.4, 27.6, 23.8, 20.8, 18.1, 12.1, 11.9; IR (ATR): 3381, 2922,

2869, 2853, 1700, 1443, 1269, 1191, 1030, 905, 611 $cm^{-1}$; HRMS (DART–) *m/z*: $[M - H]^-$ calculated for $C_{24}H_{39}O_3$ 375.2899, found 375.2908; $[\alpha]_D^{22.5}$ +28.04 (*c* 0.573, $CH_3OH$). NMR spectra and *in vitro* assay for comparison of isoalloLCA from in-house synthesis and a commercial source (Steraloids) are shown in Supplementary Fig. 3 and 4.



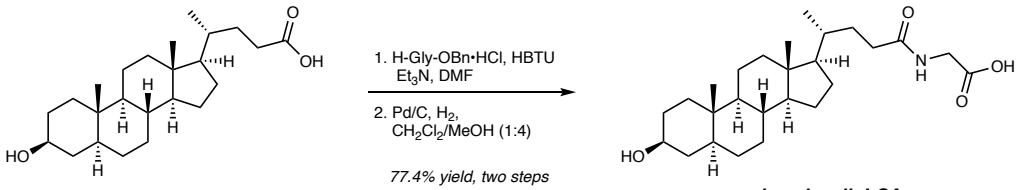

**Glyco-3-oxoLCA.** The glycine conjugate of 3-oxoLCA was prepared by amidation with a glycine ester, followed by ester cleavage. Dimethylformamide (DMF, 2.0 mL, 0.2 M) was added to a flame-dried 25 mL Schlenk flask charged with a stir bar, 3-oxoLCA (150.0 mg, 0.4004 mmol, 1.0 equivalent), and glycine benzyl ester•HCl (89.9 mg, 0.446 mmol, 1.1 equivalent) under argon to produce a slightly cloudy suspension. $Et_3N$ (167 µL, 1.20 mmol, 3.0 equivalent) and hexafluorophosphate benzotriazole tetramethyl uranium (HBTU, 154.9 mg, 0.4824 mmol, 1.2 equivalent) were added to this solution while stirring at room temperature. Upon completion by TLC analysis (1:1 hexanes/EtOAc; *p*-Anisaldehyde; ca. 24 h), the reaction was transferred to a 125 mL separatory funnel with EtOAc (25 mL) and $H_2O$ (15 mL). The funnel was mixed and the layers were separated. The organic layer was washed with 1 M HCl (10 mL), the aqueous layers were combined and further extracted with EtOAc (10 mL). The combined organic extracts were washed with brine (5 mL), dried over $MgSO_4$, filtered, and concentrated in vacuo to a pale-yellow oil. This crude oil was purified by Biotage automated flash chromatography on $SiO_2$ (20 g, 13 → 50 % EtOAc in hexanes) to afford the desired amide product as a colorless foam (184.4 mg, 0.3534 mmol, 88.3% yield). $R_f$ = 0.28 (1:1 hexanes/EtOAc; *p*-Anisaldehyde); $^1H$ NMR (600

MHz, $CDCl_3$): δ 7.39–7.33 (m, 5H), 5.96 (br s, 1H), 5.19 (s, 2H), 4.09 (d, *J* = 5.1 Hz, 2H), 2.69 (app t, *J* = 14.3 Hz, 1H), 2.32 (dtd, *J* = 20.7, 11.1, 5.0 Hz, 2H), 2.14 (ddd, *J* = 15.1, 9.9, 5.7 Hz, 2H), 2.05–2.00 (m, 3H), 1.91–1.80 (m, 4H), 1.60 (td, *J* = 8.6, 4.6 Hz, 1H), 1.52–1.18 (m, 11H), 1.14–1.06 (m, 4H), 1.02 (s, 3H), 0.93 (d, *J* = 6.5 Hz, 3H), 0.68 (s, 3H); $^{13}C\{^1H\}$ NMR (151 MHz, $CDCl_3$): δ 213.5, 173.7, 170.2, 135.3, 128.8, 128.7, 128.5, 67.3, 56.6, 56.2, 44.5, 42.9, 42.5, 41.5, 40.9, 40.2, 37.4, 37.2, 35.7, 35.6, 35.0, 33.4, 31.7, 28.3, 26.8, 25.9, 24.3, 22.8, 21.3, 18.5, 12.2; IR (ATR): 3317, 2935, 2865, 1750, 1711, 1654, 1540, 1455, 1187, 733 $cm^{-1}$; HRMS (DART+) *m/z*: $[M + NH_4]^+$ calculated for $C_{33}H_{51}O_4N_2$ 539.3843, found 539.3848; $[\alpha]_D^{23.9}$ +23.6 (*c* 0.75, $CH_2Cl_2$).

$CH_2Cl_2$ (0.70 mL) and methanol (2.8 mL; 1:4, 0.1 M) were added to benzyl glyco-3-oxoLCA (184.4 mg, 0.3534 mmol, 1.0 equivalent) in a 1 dram vial containing a stir bar, followed by Pd/C (74.6 mg, 5 wt% on carbon, 0.0350 mmol, 0.10 equivalent). The vial was equipped with a septum and affixed to a $H_2$-filled balloon. The vial headspace was purged with $H_2$ for ca. 2 min, and then mixed vigorously under $H_2$. Upon completion by TLC analysis (1:2 hexanes/ethyl acetate; *p*-Anisaldehyde; ca. 17 h), the reaction was filtered through a 0.45 μm polytetrafluoroethylene (PTFE) syringe filter with 9:1 $CH_2Cl_2$:methanol and concentrated in vacuo. $H_2O$ (20 mL) was added to the flask, and the white solid was sonicated, followed by acidification to pH < 3 with 1 M HCl. The precipitate was cooled in an ice bath and isolated via vacuum filtration. Washing and further drying (high vacuum) of the pellet afforded a mixture containing glyco-3-oxoLCA. Purification by flash chromatography on $SiO_2$ (2.5 x 22 cm, 19:1 $CH_2Cl_2$:MeOH + 1% AcOH) afforded a clear film that solidifies over time. To this dried film was added acidic $H_2O$ (15 mL, pH < 3), the contents were sonicated to disperse the solid, and

then cooled and isolated via vacuum filtration. Pellet drying under high vacuum yielded glyco-3-oxoLCA (104.7 mg, 0.2426 mmol, 60.7% yield) as a white solid.

***Characterization data:*** $R_f$ = 0.10 (19:1 $CH_2Cl_2$:MeOH + 1% AcOH; *p*-Anisaldehyde); mp 172–176 °C; $^1$H NMR (600 MHz, DMSO-$d_6$): δ 12.42 (br s, 1H), 8.09 (t, *J* = 5.8 Hz, 1H), 3.71 (d, *J* = 5.4 Hz, 2H), 2.74 (app t, *J* = 14.2 Hz, 1H), 2.36 (td, *J* = 14.6, 5.4 Hz, 1H), 2.14 (ddd, *J* = 14.2, 9.7, 4.8 Hz, 1H), 2.03 (ddd, *J* = 14.6, 9.0, 6.3 Hz, 1H), 1.96–1.94 (m, 3H), 1.84–1.78 (m, 3H), 1.74–1.64 (m, 2H), 1.56 (qd, *J* = 11.8, 3.5 Hz, 2H), 1.43–1.02 (m, 14H), 0.96 (s, 3H), 0.89 (d, *J* = 6.5 Hz, 3H), 0.65 (s, 3H); $^{13}$C{$^1$H} NMR (151 MHz, DMSO-$d_6$): δ 211.8, 172.9, 171.4, 55.69, 55.63, 43.6, 42.3, 41.9, 40.5, 36.7, 36.5, 35.1, 34.9, 34.4, 32.0, 31.4, 27.7, 26.2, 25.3, 23.8, 22.2, 20.8, 18.3, 11.9; IR (ATR): 2927, 2862, 1717, 1576, 1432, 1233 cm$^{-1}$; HRMS (DART+) *m/z*: $[M + H]^+$ calculated for $C_{26}H_{42}O_4N$ 432.3108, found 432.3109; $[\alpha]_D^{23.6}$ +32.0 (*c* 0.575, $CH_3OH$). NMR spectra are shown in Supplementary Fig. 5 and 6.

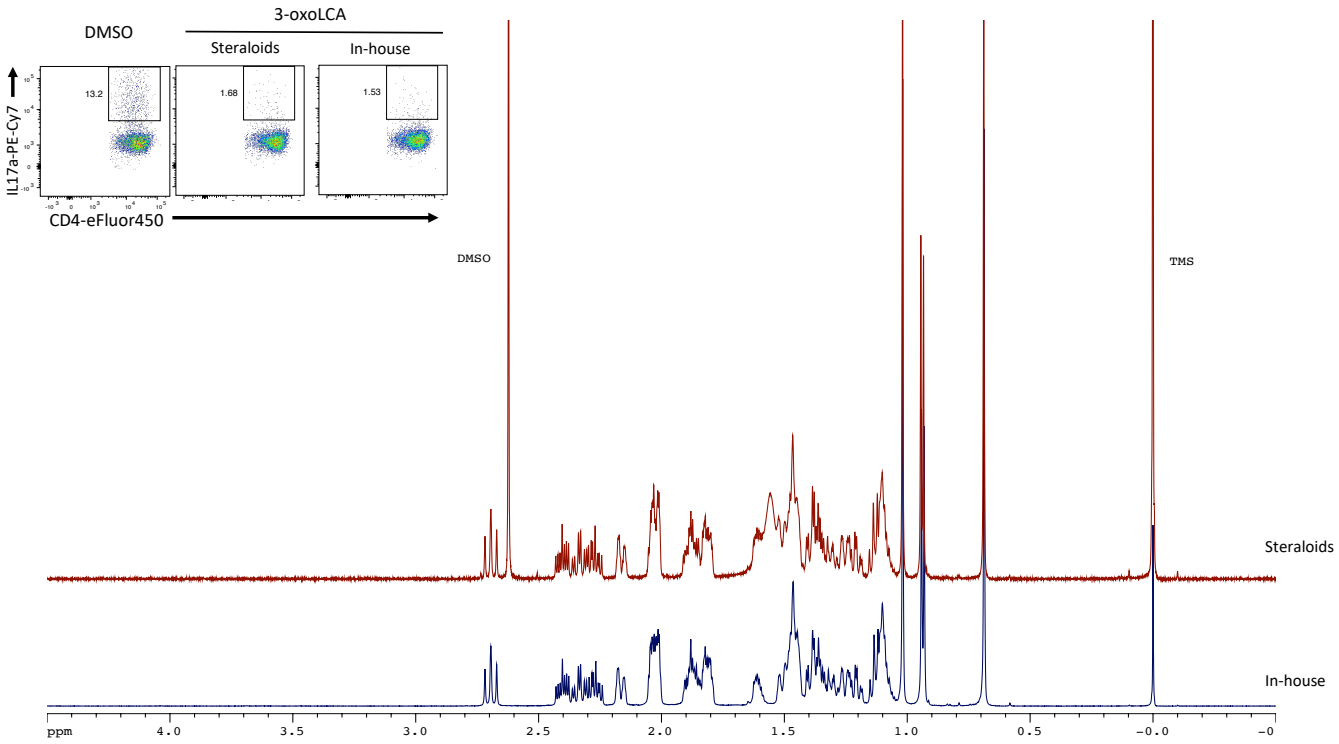



**Glyco-isoalloLCA.** Glyco-isoalloLCA was prepared using the same amidation and ester cleavage procedure used for glyco-3-oxoLCA. Amide coupling of isoalloLCA (71.8 mg, 0.1907 mmol, 1.0 equivalent) with glycine benzyl ester•HCl, followed by automated flash purification on $SiO_2$ (20 g, 16 → 80% EtOAc in hexanes) afforded benzyl glyco-isoalloLCA (90.6 mg, 0.1730 mmol, 90.7% yield) as a colorless foam. $R_f$ = 0.28 (1:1 hexanes/EtOAc; *p*-Anisaldehyde); $^1$H NMR (600 MHz, $CDCl_3$): δ 7.39–7.33 (m, 5H), 5.90 (br s, 1H), 5.19 (s, 2H), 4.09 (d, *J* = 5.1 Hz, 2H), 3.59 (tt, *J* = 10.6, 5.2 Hz, 1H), 2.29 (ddd, *J* = 14.8, 10.5, 4.7 Hz, 1H), 2.13 (ddd, *J* = 15.0, 9.9, 5.6 Hz, 1H),

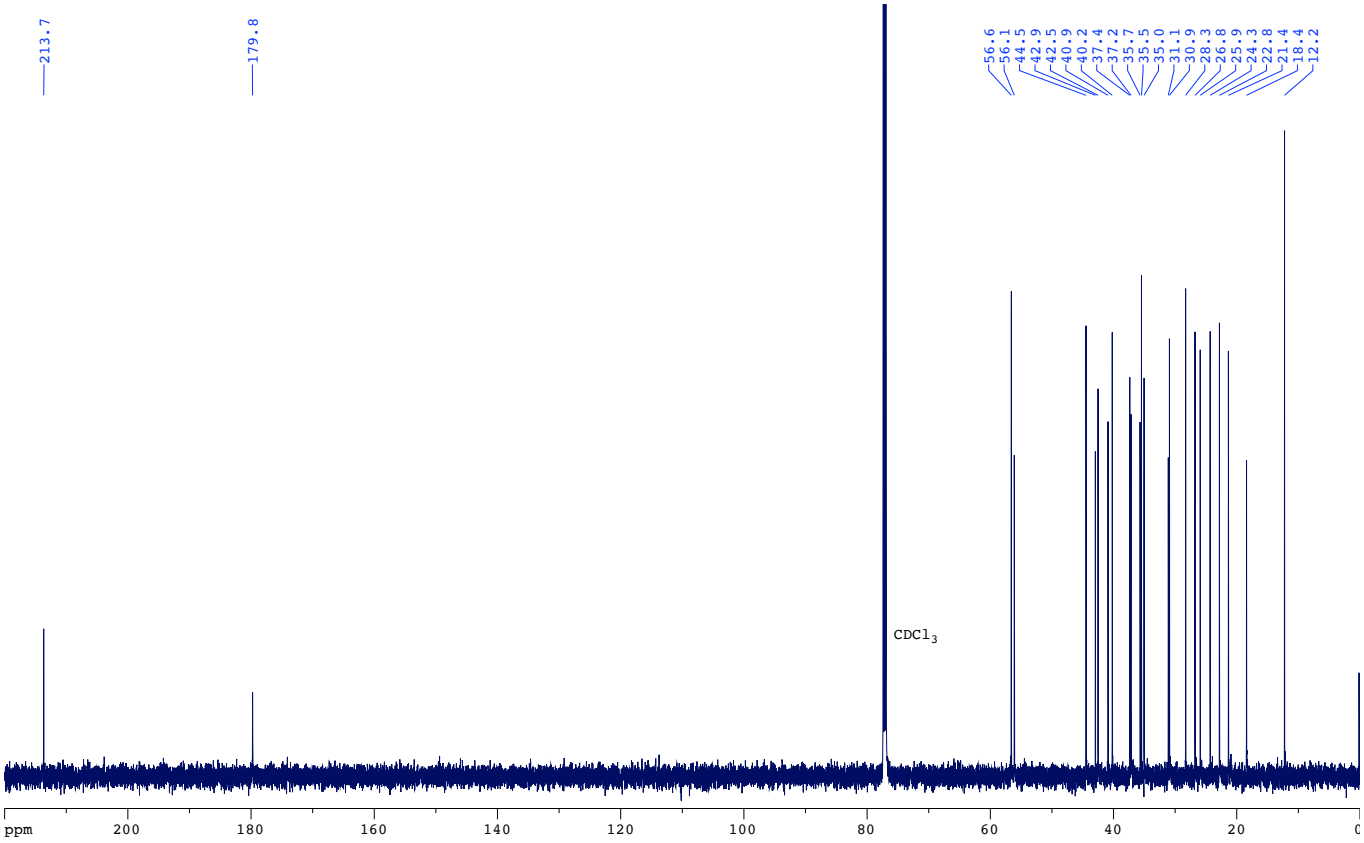
1.95–1.93 (m, 1H), 1.86–1.79 (m, 3H), 1.71–1.64 (m, 2H), 1.59–1.54 (m, 2H), 1.50–1.21 (m, 11H), 1.13–0.94 (m, 6H), 0.92 (d, $J$ = 6.5 Hz, 3H), 0.86 (dd, $J$ = 12.0, 5.6 Hz, 1H), 0.80 (s, 3H), 0.65 (s, 3H), 0.62–0.60 (m, 1H); $^{13}C\{^{1}H\}$ NMR (151 MHz, $CDCl_3$): δ 173.8, 170.2, 135.3, 128.8, 128.7, 128.5, 71.5, 67.4, 56.6, 56.1, 54.5, 45.0, 42.8, 41.5, 40.2, 38.4, 37.2, 35.66, 35.64, 35.62, 33.4, 32.2, 31.74, 31.70, 28.9, 28.3, 24.3, 21.4, 18.5, 12.5, 12.3; IR (ATR): 3301, 2927, 2862, 1751, 1653, 1540, 1188, 1040, 733 $cm^{-1}$; HRMS (DART+) *m/z*: $[M + H]^+$ calculated for $C_{33}H_{50}O_4N$ 524.3734, found 524.3739; $[\alpha]_D^{22.4}$ +16.9 (*c* 0.65, $CH_2Cl_2$).

Hydrogenolysis of benzyl glyco-isoalloLCA (50.7 mg, 0.0968 mmol, 1.0 equivalent) with Pd/C and $H_2$ according to glyco-3-oxoLCA, followed by filtration, concentration, and precipitation with acidic $H_2O$ (pH < 3) afforded glyco-isoalloLCA (35.8 mg, 0.0826 mmol, 77.4% yield) as a white powdery solid.

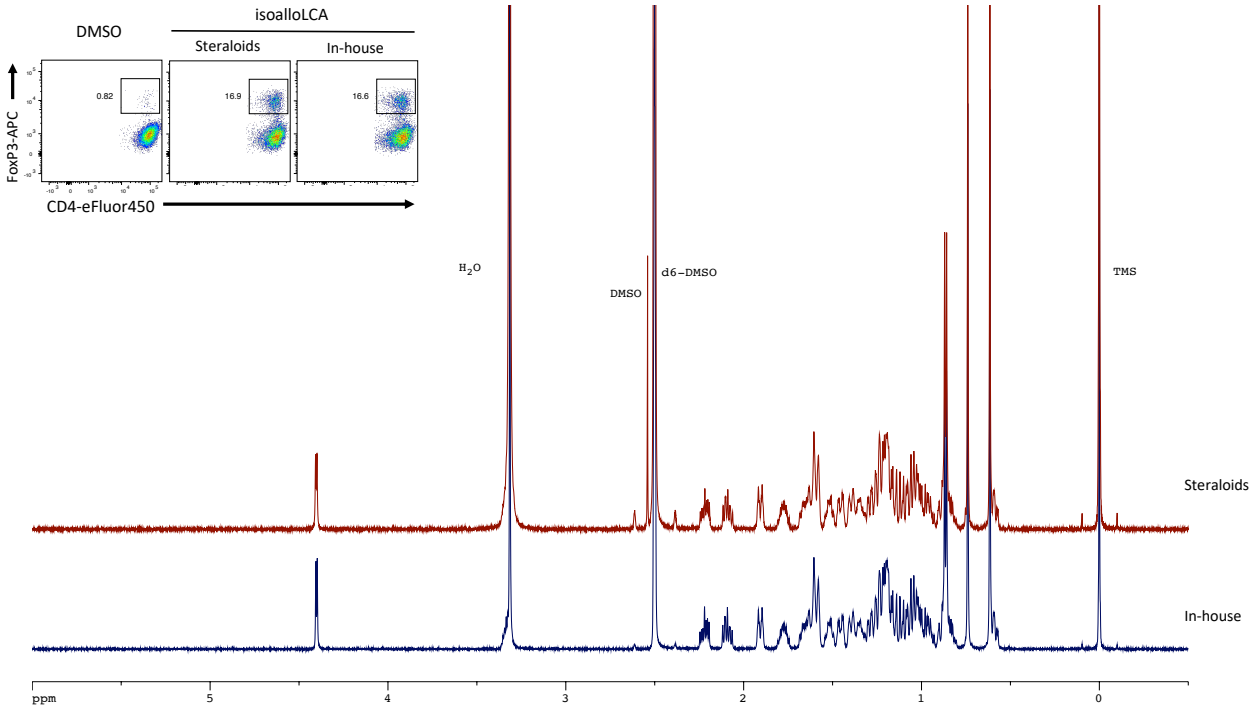
***Characterization data:*** $R_f$ = 0.04 (1:2 hexanes:EtOAc; *p*-Anisaldehyde); mp 225–230 °C; $^{1}H$ NMR (600 MHz, $CD_3OD$): δ 3.88 (s, 2H), 3.50 (tt, $J$ = 10.7, 5.1 Hz, 1H), 2.29 (ddd, $J$ = 14.3, 9.9, 4.8 Hz, 1H), 2.16 (ddd, $J$ = 14.1, 9.8, 6.6 Hz, 1H), 2.01–1.98 (m, 1H), 1.91–1.85 (m, 1H), 1.83–1.67 (m, 4H), 1.62–1.57 (m, 1H), 1.54–1.26 (m, 11H), 1.17–0.88 (m, 8H), 0.96 (d, $J$ = 6.6 Hz, 3H), 0.83 (s, 3H), 0.69 (s, 3H), 0.68–0.63 (m, 1H); $^{13}C\{^{1}H\}$ NMR (151 MHz, $CD_3OD$): δ 177.1, 173.1, 71.9, 57.9, 57.5, 55.9, 46.2, 43.8, 41.7, 41.4, 38.9, 38.3, 36.91, 36.78, 36.61, 33.8, 33.3, 33.1, 32.1, 30.0, 29.2, 25.2, 22.4, 18.9, 12.8, 12.5; IR (ATR): 3314, 2925, 2851, 1742, 1625, 1220, 1046, 1031, 841 $cm^{-1}$; HRMS (DART+) *m/z*: $[M + H]^+$ calculated for $C_{26}H_{44}O_4N$ 434.3265, found 4345.3267; $[\alpha]_D^{23.8}$ +22.4 (*c* 0.41, $CH_3OH$). NMR spectra are shown in Supplementary Fig. 7 and 8.



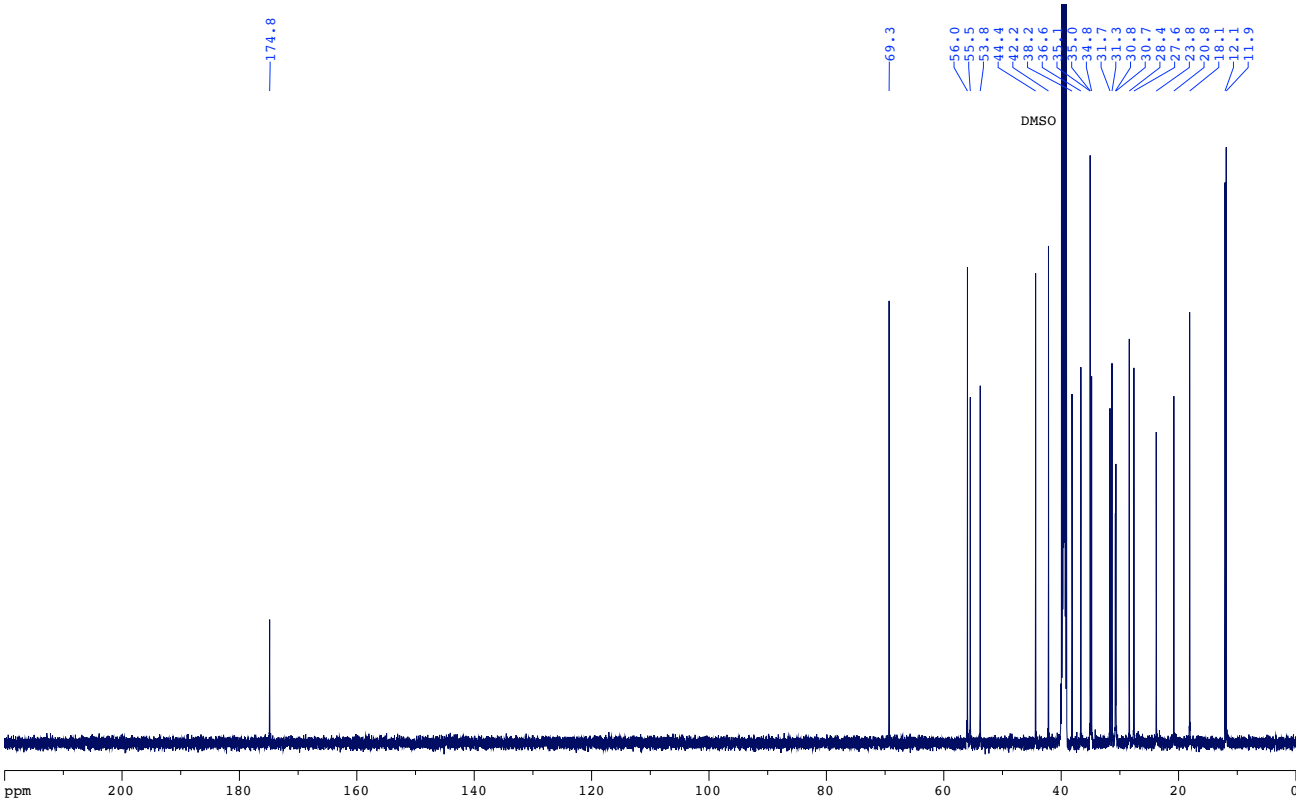

**Supplementary Figure 1. $^{1}$H NMR spectrum (600 MHz, $CDCl_3$) of 3-oxoLCA and verification by in vitro assay.** The compound data and spectrum of 3-oxoLCA are representative of four independent synthesis experiments.



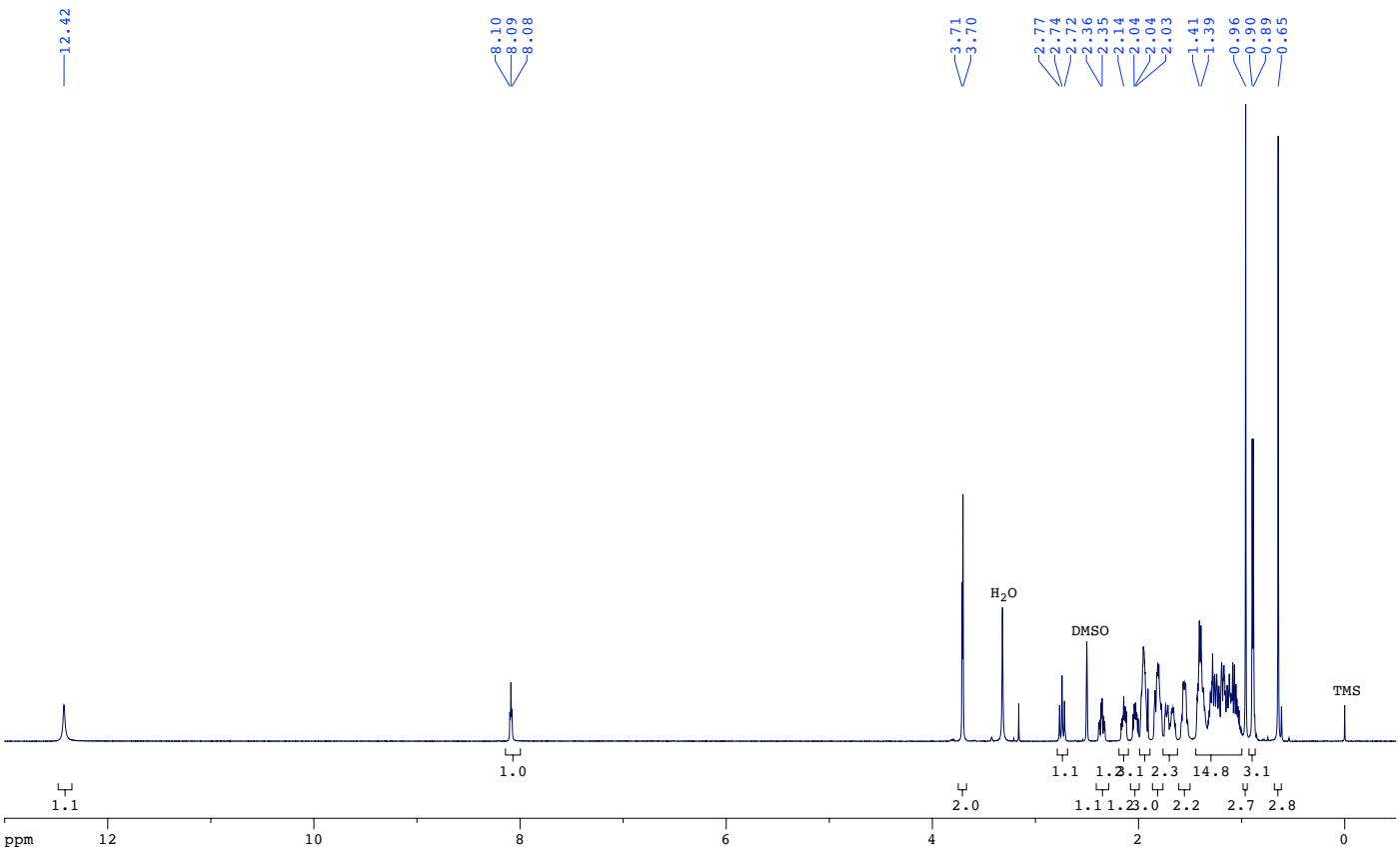

**Supplementary Figure 2. $^{13}C\{^{1}H\}$ NMR spectrum (151 MHz, $CDCl_3$) of 3-oxoLCA.** The compound data and spectrum of 3-oxoLCA are representative of four independent synthesis experiments.



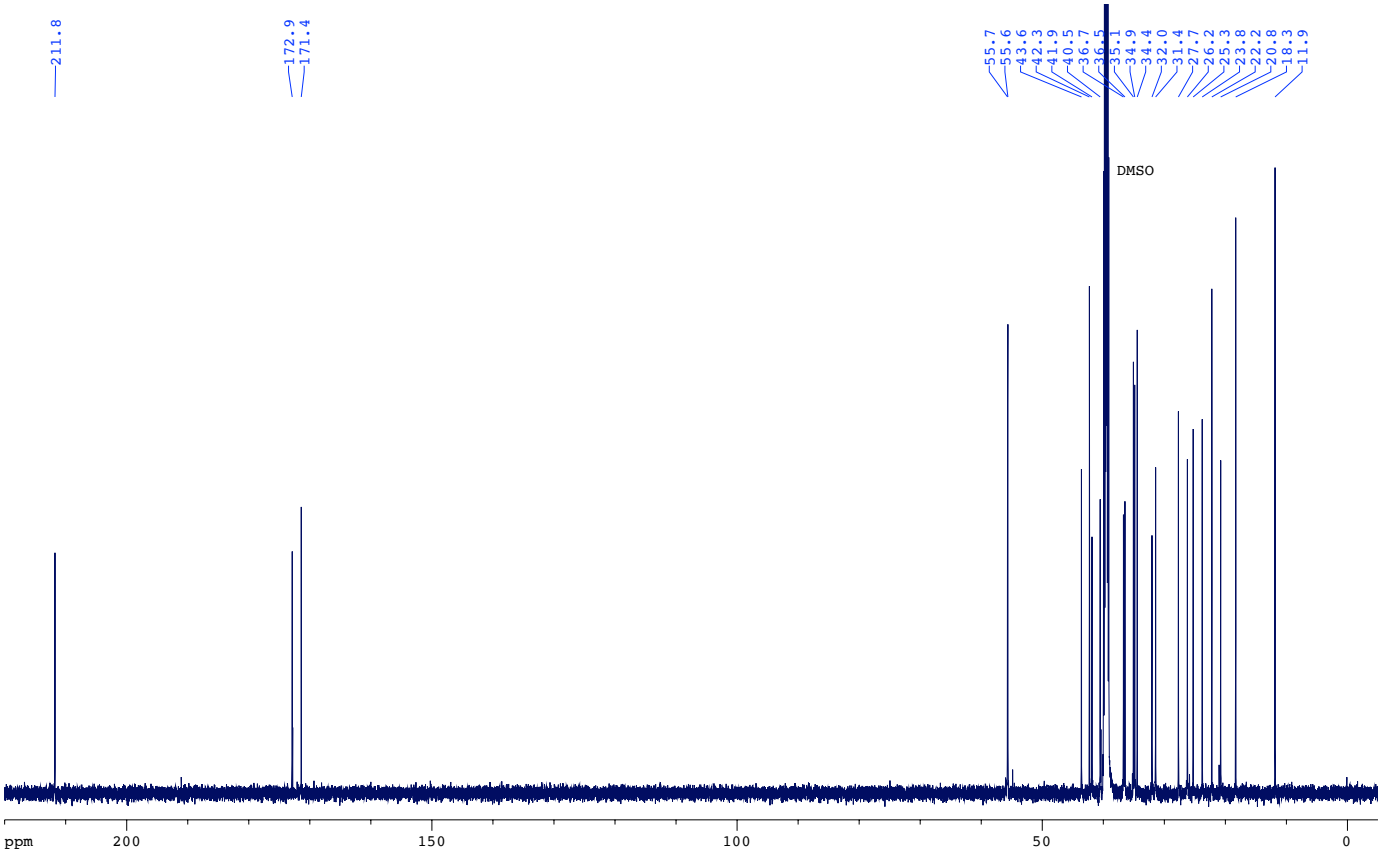

**Supplementary Figure 3. $^{1}$H NMR spectrum (600 MHz, DMSO-$d_6$) of isoalloLCA and verification by in vitro assay.** The compound data and spectrum of isoalloLCA are representative of five independent synthesis experiments.



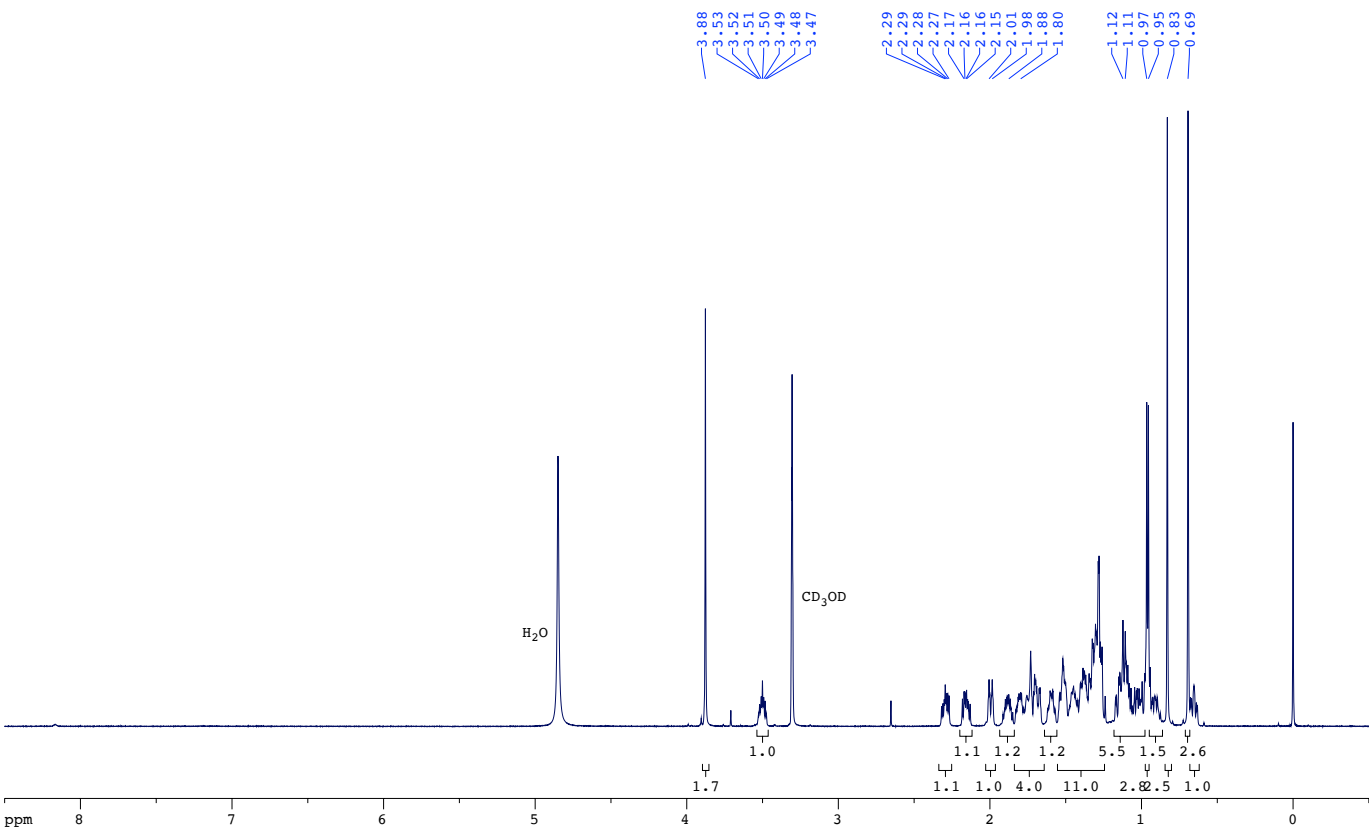

**Supplementary Figure 4. $^{13}C\{^{1}H\}$ NMR spectrum (151 MHz, DMSO-$d_6$) of isoalloLCA.** The compound data and spectrum of isoalloLCA are representative of five independent synthesis experiments.



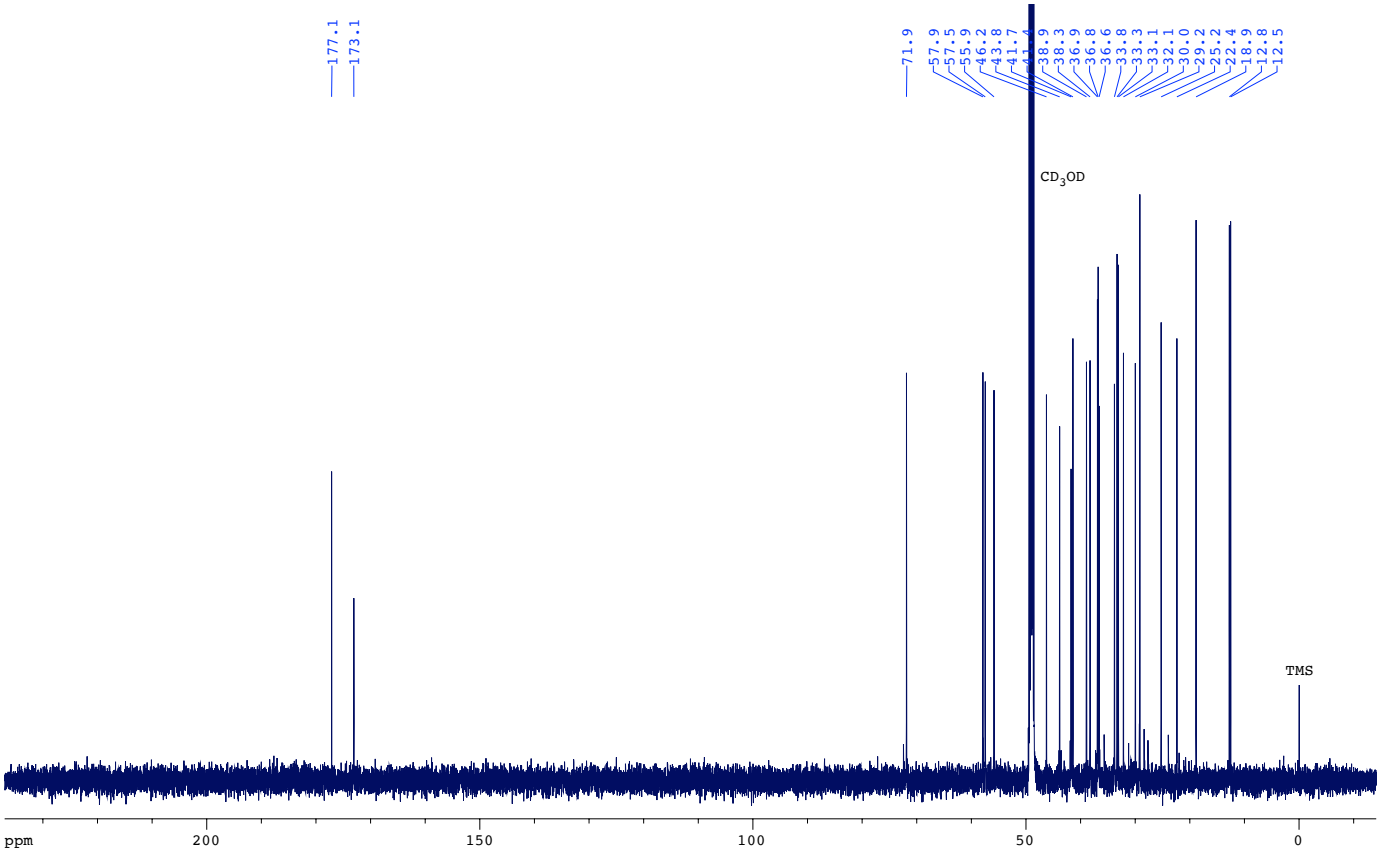

**Supplementary Figure 5. $^{1}$H NMR spectrum (600 MHz, DMSO-d$_6$) of glyco-3-oxoLCA.** The compound data and spectrum of glyco-3-oxoLCA are representative of one synthesis experiment.




**Supplementary Figure 6. $^{13}C\{^{1}H\}$ NMR spectrum (151 MHz, DMSO-*d*$_6$) of glyco-3-oxoLCA.** The compound data and spectrum of glyco-3-oxoLCA are representative of one synthesis experiment.




**Supplementary Figure 7. $^{1}$H NMR spectrum (600 MHz, $CD_3OD$) of glyco-isoalloLCA.** The compound data and spectrum of glyco-isoalloLCA are representative of one synthesis experiment.




**Supplementary Figure 8. $^{13}C\{^{1}H\}$ NMR spectrum (151 MHz, $CD_3OD$) of glyco-isoalloLCA.** The compound data and spectrum of glyco-isoalloLCA are representative of one synthesis experiment.


1 Nahar, L. & Turner, A. B. Synthesis of ester-linked lithocholic acid dimers. *Steroids* **68**, 1157-1161 (2003).

2 Yu, D. D. *et al.* Stereoselective synthesis, biological evaluation, and modeling of novel bile acid-derived G-protein coupled bile acid receptor 1 (GP-BAR1, TGR5) agonists. *Bioorg Med Chem* **23**, 1613-1628, doi:10.1016/j.bmc.2015.01.048 (2015).

3 Sepe, V. *et al.* Marine and semi-synthetic hydroxysteroids as new scaffolds for pregnane X receptor modulation. *Mar Drugs* **12**, 3091-3115, doi:10.3390/md12063091 (2014).